PAPERS AND ORIGINALS

Epidemic spread of Salmonella hadar in England and Wales

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Summary and conclusions

Salmonella hadar is now the second commonest serotype isolated from cases of food poisoning in England and Wales. Turkeys are the main reservoir of the organism and there is an urgent need to eradicate it from the breeding stocks; though this would be expensive, the cost must be balanced against the cost of treating the human disease.

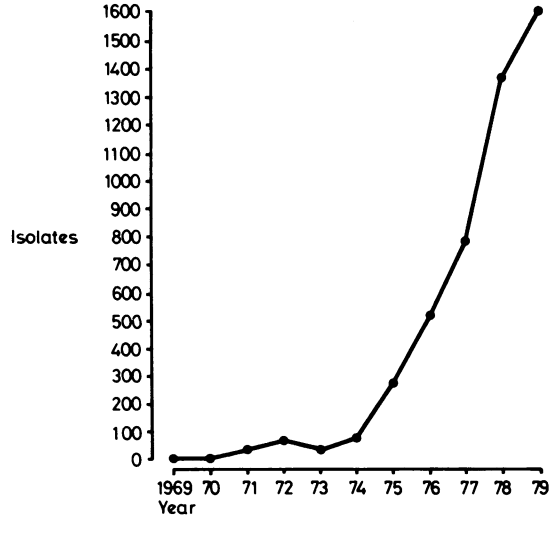
Introduction

During the past three years *Salmonella hadar* has become the second most prevalent serotype isolated from patients in England and Wales; most of the isolations have been from cases of food poisoning. This prevalence has warranted the development of a phage-typing scheme to provide more precise surveillance.

Epidemiology

Before 1971 *S hadar* was seldom identified: only eight strains had been isolated from man, one from a sewer swab, and none from animals. The eight human infections included a family outbreak affecting three persons; and of the remaining five cases, three were in people who had recently returned from Africa.

In July 1971 the head waiter at a large London hotel was infected, and in the same month several other cases occurred in London. By the end of the year 38 strains had been identified from people in several parts of England and Wales. In subsequent years there was a progressive increase in the number of isolations until by 1975 the serotype had become one of the "top-ten" most prevalent serotypes causing infections in man. The records of our division show that in that year *S hadar* accounted for 3% (298) of all isolations. The figures for 1976, 1977, and 1978 were 5·5% (532), 10·9% (809), and 14·3% (1360) respectively. During 1979 this alarming trend continued (figure) and 1600 strains were identified. Our information refers to only a fraction of the infections caused by *S hadar*.



Epidemic of *S hadar* in England and Wales investigated by phage typing.

The table gives information on strains submitted to the reference laboratory from outbreaks that affected more than one family or household. Beginning in 1976 there was a dramatic increase in the number of outbreaks of food poisoning caused by *S hadar*. In about 46% of these, turkeys were incriminated as the vehicle of infection. Many of the outbreaks affected large numbers of people—over 600 in one—and occurred in catering establishments such as restaurants, hotels, and hospitals. The turkeys were usually large, and in some outbreaks there was evidence of inadequate thawing, insufficient cooking, and keeping cooked meat at ambient temperatures before eating. Although correction of such malpractices would help to reduce the number of outbreaks, it would be only an adjunct to tackling the main cause of the problem, which is persistence of a high incidence

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General outbreaks of food poisoning caused by S hadar (percentages in parentheses)

Year	Total	Vehicle of infection			
		Turkey	Chicken	Bovine	Unknown
1971					
1972	2				2
1973					
1974	4	3			1
1975	8	4	1		3
1976	17	13	2		2
1977	30	15	3	1	11
1978	37	15	5		17
1979	57	21	5	3	28
Total	155	71 (46)	16 (10)	4 (3)	64 (41)

of infection in poultry. There is no doubt that turkeys are the main reservoir for *S hadar* and that the serotype is widely distributed in turkey flocks throughout England and Wales. The serotype is isolated regularly from turkeys on the premises of some of the largest producers in Britain. The Zoonoses Order reports for 1978[1] show that in England and Wales there were 138 incidents due to the serotype; 96 (70%) concerned turkeys and 40 (29%) fowls.

Phage-typing scheme

Currently 35 different phage types are recognised. Our division receives salmonella strains from laboratories throughout England and Wales, and in a retrospective study strains that had been referred since 1971 were phage typed.

During 1971 and 1972 five strains were received from chickens, cattle, and pigs and all belonged to phage type 2. Eighty-five strains isolated from people during those years were available for study, and 77 belonged to phage type 2. In 1973 and 1974 strains of phage type 2 were received from the premises of the largest turkey breeder in Britain, and within six months several outbreaks occurred in hotels and restaurants in the south-east of England. The figure shows that the almost exponential phase of the *S hadar* epidemic began at that time. In 1979, 90% of all isolations from turkeys and man belonged to phage type 2. The remaining phage types occurred in man, and also in turkeys and chickens, and to a less extent in cattle. During 1977-9 the number of different phage types in poultry and man increased. Thus four new types were identified in 1977, nine in 1978, and six in 1979. In most instances the new phage types were isolated from poultry and man. Laboratory studies suggest that this diversification of phage types results from acquiring phage-restricting plasmids or temperate phages; the details will be reported elsewhere. If these new phage types become established the epidemiological value of the scheme will be enhanced.

Comment

During the past 10 years *S typhimurium* has remained the predominant cause of human salmonellosis in Britain but the epidemiological pattern has been greatly influenced by the appearance of *S agona* and *S hadar*. *S agona* was introduced in fish meal imported from Peru and then quickly became established in pigs and poultry. The epidemiology of *S hadar* is different, and an association with imported animal feed has not been established. Whatever the origin there is little doubt that the most important single event in the establishment of *S hadar* in Britain was its appearance in the early 1970s in the stock of a large turkey breeder. Subsequently breeding stock was distributed to numerous rearing units, which led to the spread to man. Evidence suggests that particular genetic lines of turkeys are affected, more especially those producing large birds for the catering trade. It seems likely that the nucleus breeding flock of these lines is persisting as the reservoir of infection, and there is a need to investigate the mechanisms that contribute to the transmission and persistence in flocks. There is an urgent need to eradicate *S hadar* from these breeding flocks. This will be expensive for the poultry producers but the expense should be weighed against the health expenditure caused by *S hadar* infections in man.

Recycling waste products from poultry plants now helps in disseminating salmonellosis, and this is true for *S hadar*. The suggestions that dried poultry manure may be used as a source of protein for animal feeds is also a cause for concern unless this material can be adequately sterilised. Implementing the proposed legislation for heat treatment of protein animal feeds seems to be subject to prolonged delays but such legislation when implemented would undoubtedly help in breaking the chain of zoonotic salmonellosis.

The study of the epidemic spread of *S hadar* in England and Wales emphasises several potential intervention measures. These encompass areas as diverse as husbandry practices in turkey-breeding flocks, processing of recycled animal feeds, and catering practices in food-service establishments.

Reference

[1] Anonymous. Animal salmonellosis. (Reports under the Zoonoses Order 1975.) *1978 Annual Summary*. London: Ministry of Agriculture, Fisheries and Food, Welsh Office of Agriculture, Department of Agriculture and Fisheries for Scotland, 1979.

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ONE HUNDRED YEARS AGO Dr Decaisne has made a communication to the French annals of public medicine on women who smoke. In 1864, he studied the intermittence of the beating of the heart and pulse as a sequel to the abuse of tobacco-smoking. He observed, in the memoir read to the Académie des Sciences, that if one consider, first, that none of the subjects submitted to examination were attacked by any organic lesion of the heart; second, that the majority of them were not in the conditions of health which favour the production of intermittence of the beating of the heart; third, that it sufficed, in nine of these individuals, to suppress the use of tobacco to see the heart return to its normal rhythm; that the following conclusions will not be considered premature. The abuse of tobacco produces, in certain subjects, a state which may be called nicotism of the heart, and which is translated by intermittence in the beating of the heart and in the pulsations of the radial artery. It is enough, in certain cases, to suspend, or at least to reduce, the use of tobacco in smoking to see the irregularity in the functions of the heart disappear entirely or diminish. In 1864, Dr Decaisne related cases of thirty-eight young people, in twenty-seven of whom the effects of tobacco on the economy were observable, especially in cardiac affections, palpitations, and intermittences. He terminated his work by saying that, whatever conditions may be perceived in ascertaining in adult subjects the pernicious effects of tobacco-smoking, they are incontestable in children. Even the restricted use of tobacco in children leads often to a change in the blood, and sometimes to chlorotic anaemia, paleness of the face, emaciation, morbid sounds in the carotid arteries, palpitation and intermittence of the heart, diminution of the normal quantity of the blood-corpuscles, difficulty of digestion, etc. The ordinary treatment of anaemia and of chlorotic anaemia produced no effect in general whilst the habit is continued. Young people who smoke show generally a certain sluggishness of intelligence, and a more or less pronounced taste for strong drinks. In children who cease to smoke, and who are not affected by any organic lesion, the disorders of the economy which have just been mentioned disappear, often very quickly, and almost always without leaving any trace. Since 1865, Dr Decaisne has commenced to examine the effects of tobacco on women. He has observed forty-three women, who present symptoms arising from this source, including intermittence of the pulse, disorders in the menstruation and digestion; and he has arrived at the same conclusions as he arrived at in 1864. He adds that the effects of tobacco-smoking in women appear to him to resemble very closely those which he observed in children; that in a certain number of them, as among children, even in a relatively small dose, tobacco leads promptly to the symptoms of anaemia, as well as intermittent pulse, and develops for the most part a pronounced taste for strong drinks. (*British Medical Journal*, 1880.)